Implant Guidelines for the Restorative Dentist

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Implant Guidelines for the Restorative Dentist

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Right now my life is just one learning experience after another.....

By the end of the week I should be a genius!

Implant Guidelines

- **What is a dental implant?**
  - **Definition**
    - an endosteal (within bone) alloplastic biologically compatible material surgically inserted into the edentulous bony ridge

Implant Guidelines

- What is a dental implant?
  - Use
    - –to serve as a foundation for prosthodontic restoration

Implant Guidelines

- **What is a dental implant?**
  - **History (endosseous)**
    - dates to Egyptians
    - Greenfield (1913) -
      - patented two-stage system
    - Formiggini (1947) -
      - "father of modern implantology"
      - helical wire spiral

Implant Guidelines

- **What is a dental implant?**
  - **History (endosseous)**
    - **single stage**
      - **one-piece from bone through oral mucosa (crystal sapphire implants)**
    - **two-stage**
      - **bony implant separate from transmucosal portion**
      - **variable design & materials**

Implant Guidelines

- **What is a dental implant?**
  - **Biomaterials**
    - **most commonly used**
      - **commercially pure (CP) titanium**
      - **titanium-aluminum-vanadium alloy (Ti-6Al-4V) - stronger & used w/ smaller diameter implants**

Implant Guidelines

- **What is a dental implant?**
  - **Titanium**
    - –lightweight
    - –biocompatible
    - –corrosion resistant
      (dynamic inert oxide layer)
    - –strong & low-priced

Implant Guidelines

- **What is a dental implant?**
  - **Fixture types**
    - **HA coated**
    - **Ti surface modified**
    - **tap or self-tapping**
    - **screw or press fit**

Implant Guidelines

- **What is a dental implant?**
  - **“Osseointegration”**
    - **Bränemark - late 1980’s**
      - **direct structural & functional connection between ordered, living bone & surface of a load-carrying implant**

Implant Guidelines

- **What is a dental implant?**
  - **"Osseointegration"**
    - **similar soft-tissue relationship to natural dentition (sulcular epithelium)**
    - **hemi-desmosome like structures connect epithelium to titanium surface**

Implant Guidelines

- **What is a dental implant?**
  - **"Osseointegration"**
    - **circumferential and perpendicular connective tissue**
    - **no connective tissue insertion**
    - **no intervening Sharpey's fiber attachment**

Implant Guidelines

- **What is a dental implant?**
  - **"Osseointegration"**
    - **bone-implant interface**
      - **osteoblasts in close proximity to interface**
      - **separated from implant by thin amorphous proteoglycan layer**
      - **osseointegration - highly predictable**

Implant Guidelines

- **What is a dental implant?**
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Implant Guidelines

- **What is a dental implant?**
  - **"Osseointegration"**
    - **bone-implant interface**
      - **oxide layer continues to grow- (2000 A at 6 yrs) - mineral ion interaction**
      - **increase in trabecular pattern**
      - **bone deposition & remodeling in response to stress**

Implant Guidelines

- **What is a dental implant?**
  - **"Osseointegration"**
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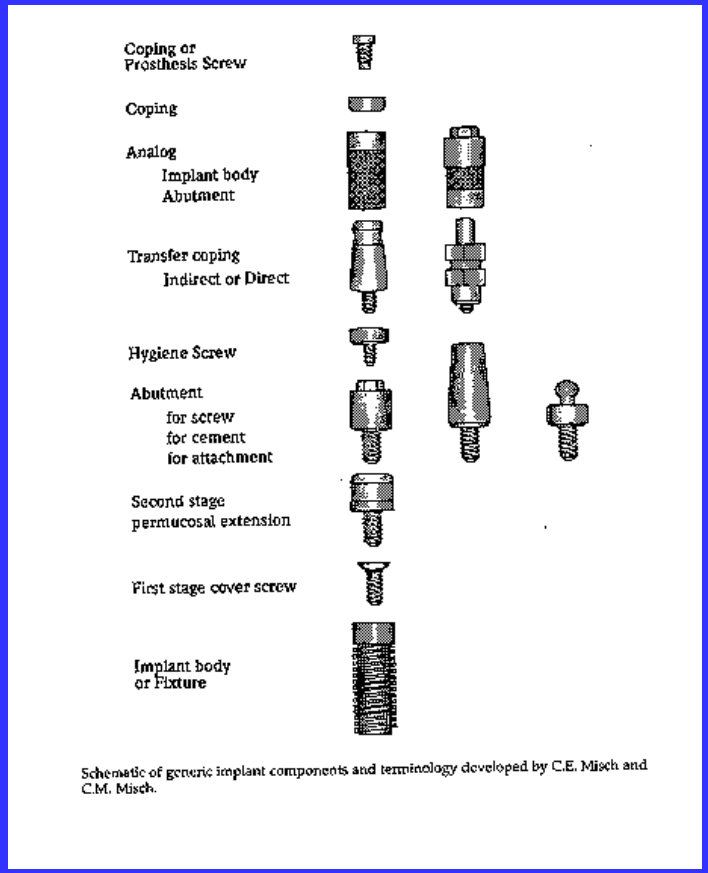
Implant Guidelines

- **What is a dental implant?**
  - **Components & terminology**
    - coping or prosthesis screw (top)
    - coping
    - analog
      - implant body
      - abutment
    - transfer coping (indirect or direct)

Implant Guidelines

- **What is a dental implant?**
  - **Components & terminology**
    - hygiene screw
    - abutment
      - for screw, cement or attachment
    - second stage permucosal abutment
    - first stage cover screw
    - implant body or fixture (bottom)

Implant Guidelines



Schematic of generic implant components and terminology developed by C.E. Misch and C.M. Misch.

Implant Guidelines

- **What is a dental implant?**
  - **Modern types**
    - **implants are small -**
      - **standard abutment - usually 3.75mm or larger in diameter**
      - **wide-body or wide-platform - up to 6.0mm**

Implant Guidelines

- **What is a dental implant?**
  - **Modern types**
    - **lengths - typically range from about 7 to 18mm**
    - **Navy uses "external hex"**
      - **good research literature**
      - **able to be maintained**
      - **(3i or Nobel Biocare systems)**

Implant Guidelines

- **What is a dental implant?**
  - **Modern types (Nobel Biocare)**
    - **Fixtures**
      - **Standard**
      - **Mk II**

Implant Guidelines

- **What is a dental implant?**
  - **Modern types (Nobel Biocare)**
    - **Abutments**
      - Standard
      - CeraOne
      - EsthetiCone
      - MirusCone
      - Angulated 17º (new) or 30º

Implant Guidelines

- **What is a dental implant?**
  - **Modern types (Nobel Biocare)**
    - **Standard**
      - **no anti-rotational properties**
      - **can use for multiple units**
      - **can use for hybrid dentures**

Implant Guidelines

- **What is a dental implant?**
  - **Modern types (Nobel Biocare)**
    - CeraOne
      - single tooth esthetic replacement
      - abutment attached to fixture w/ restoration cemented to abutment
      - accommodation for fixture misalignment
      - can provisionalize

Implant Guidelines

- **What is a dental implant?**
  - **Modern types (Nobel Biocare)**
    - **EsthetiCone**
      - **esthetic FPD restorations**
      - **machined gold cylinder abutment allows crown margin to seat close to fixture (within 1mm)**

Implant Guidelines

- **What is a dental implant?**
  - **Modern types (Nobel Biocare)**
    - **MirusCone**
      - **esthetic FPD restorations**
      - **use when decreased vertical height**
      - **allows 4.5mm clearance**

Implant Guidelines

- **What is a dental implant?**
  - **Modern types (Nobel Biocare)**
    - **Angulated abutment 17º or 30º**
      - **use to achieve better esthetic result where complicated anatomy exists**
      - **use if less than ideal fixture placement**
      - **use where esthetic cervical margin required**

Implant Guidelines

- **What is a dental implant?**
  - **Modern types (Nobel Biocare)**
    - CeraOne
    - EsthetiCone
    - MirusCone
    - Angulated abutments
  - **All come with narrow, regular or wide platforms (NP, RP, WP)**

Implant Guidelines

- **What is a dental implant?**
  - **Modern types (3i)**
    - **Fixtures**
      - **MicroMiniplant**
      - **Miniplant**
      - **Standard**
      - **Wide Diameter**
        (↑ surface area to use where ↓ vertical height)

Implant Guidelines

- **What is a dental implant?**
  - **Modern types (3i)**
    - **Fixtures**
      - **ICE (incremental cutting edge)**
        - » super self-tapping implant
        - » uses tapered cutting flutes
        - » allows more placement control
        - » rapid bone engagement & implant stabilization

Implant Guidelines

- **What is a dental implant?**
  - **Modern types (3i)**
    - **Abutments**
      - **EP (conical) - (esthetic profile)**
      - **Gold UCLA-type**
      - **Two-piece abutment post**
      - **STA (standard)**
      - **Pre-Angled**
      - **New Gold Standard ZR (zero rotation)**

Implant Guidelines

- **What is a dental implant?**
  - **Modern types (3i)**
    - **Gold UCLA-type abutment**
      - **screw-retained at fixture level**
      - **non-segmented abutment**
      - **screw-retained crown to implant**
      - **uses larger screw because it runs all the way to the fixture**

Implant Guidelines

- **What is a dental implant?**
  - **Modern types (3i)**
    - **Gold UCLA-type abutment**
      - **thin buccal-lingual tissues**
      - **limited inter-occlusal distance (as little as 4.5mm)**
      - **single or multiple units**

Implant Guidelines

- **What is a dental implant?**
  - **Modern types (3i)**
    - **EP (conical) - (esthetic profile)**
      - **screw-retained crown to the abutment**
      - **gold cylinder**
      - **non-parallel implant placement**
      - **single or multiple units**
      - **minimum 7mm inter-occlusal distance required**

Implant Guidelines

- **What is a dental implant?**
  - **Modern types (3i)**
    - **Two-piece abutment post**
      - **non-rotational**
      - **cement-retained crown to the abutment**
      - **simplicity of treatment - chairside preparation**
      - **use when access to posterior region w/ screw driver is limited**

Implant Guidelines

- **What is a dental implant?**
  - **What's new? (3i)**
    - **Prep-Tite Posts**
      - **screw retained abutment**
      - **standard impression procedure**
      - **cemented restoration**
      - **6º taper with 3 vertical grooves**
      - **multiple collar heights**

Implant Guidelines

- **What is a dental implant?**
  - **What's new? (3i)**
    - **Osseotite ("clot retentive surface")**
      - **specific micro-topographic acid-etched implant surface design Vs. machined-surface implant**
      - **single stage implant**
      - **loaded after 2 months**
      - **claim 98.5% success after 3 years**

Implant Guidelines

- **What is a dental implant?**
  - **Remember….**
    - **For FPD's**
      - **plan for screw-retained restorations**
      - **no anti-rotational properties**
      - **always use at least 2 fixtures when restoring posterior spaces not bound by natural teeth!**

Implant Guidelines

- **What is a dental implant?**
  - **Advantages**
    - no preparation of tooth/adjacent teeth
    - bone stabilization & maintenance
    - retrievability
    - improvement of function
    - psychological improvement

Implant Guidelines

- **What is a dental implant?**
  - **Disadvantages**
    - risk of screw loosening
    - risk of fixture failure
    - length of treatment time
    - need for multiple surgeries
    - challenging esthetics

Implant Guidelines

- **Consultation Appointment**
  - **Treatment planning phase**

"Diagnosis begins with a complete patient evaluation"

- guidelines for "decision-making" process
- treat the "entire" patient
- restore form, function & esthetics

Implant Guidelines

- **Consultation Appointment**
  - **Treatment planning phase**
    - problem list & patient desires
    - initial evaluation
      - chief complaint
      - medical/dental history review
      - intra/extraoral exam
      - evaluation of existing prosthesis

Implant Guidelines

- **Consultation Appointment**
  - **Treatment planning phase**
    - **initial evaluation**
      - **diagnostic impressions/articulated casts**
      - **radiographs - panoramic and periapical (CT scan or tomography - as indicated)**
      - **photographs**

Implant Guidelines

- **Consultation Appointment**
  - **Treatment planning phase**
    - treatment options/informed consent
    - explanation of long-term commitment
    - restorative - surgical joint consult
    - two-stage surgery
      - *stage I*
      - *stage II*

Implant Guidelines

- **Consultation Appointment**
  - **Treatment planning phase**
    - **two-stage surgery**
      - **(use of clear acrylic surgical stent is mandatory!)**
    - ***stage I* - implant fixture placement w/ cover screw (left submerged)**

Implant Guidelines

- **Consultation Appointment**
  - **Treatment planning phase**
    - ***stage I*** **- healing phase**
      - **3 month minimum (mandible) - usually 6 months for posterior regions**
      - **6 month minimum (maxilla) - usually 6-9 months for all regions**

Implant Guidelines

- **Consultation Appointment**
  - **Treatment planning phase**
    - ***stage II*** **- uncovering & placement of transmucosal healing abutment**
    - **healing phase**
      - **4-6 weeks for soft tissue healing**

Implant Guidelines

- **Consultation Appointment**
  - **Treatment planning phase**
    - restorative phase
    - maintenance and regular recall
    - fee & payment policy
    - goal to restore form, function & esthetics

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - teeth
    - periodontium
    - radiographic analysis
    - surgical analysis
    - esthetic analysis

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - occlusal analysis
    - advs/disadvs of proposed treatment
    - referrals/specialty consults
    - appointment sequencing
    - treatment alternatives

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **teeth**
    - **periodontium**
    - **radiographic analysis**
    - **surgical analysis**
    - **esthetic analysis**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **teeth - number & existing condition**
      - **prognosis of remaining teeth**
      - **size, shape & diameter of existing dentition**
      - **tooth & root angulations & proximity**
      - **mesiodistal width of edentulous space**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **teeth - number & existing condition**
      - **minimum 6-7mm between teeth to facilitate implant placement (based on 3mm fixture)**
      - **> 1.5mm between implant & natural teeth**
      - **7mm from center of implant - to center of implant for edentulous area**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **teeth - number & existing condition**
      - **more than 10mm mesiodistal space - single tooth implant *not* recommended**
      - **(multiple abutments should be splinted)**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - teeth
    - periodontium
    - radiographic analysis
    - surgical analysis
    - esthetic analysis

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **periodontium - bone support**
    - **Lekholm & Zarb classification**
      - ***quality* - best - thick compact cortical bone w/core of dense trabecular cancellous bone**
      - **best region - mandibular symphysis; poorest in posterior regions**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **periodontium - bone support**
      - ***quantity*** **- required for implant -**
        - **6mm buccal-lingual width w/sufficient tissue volume**
        - **8mm interradicular bone width**
        - **10mm alveolar bone above IAN canal or below maxillary sinus**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **periodontium - bone support**
      - ***quantity* - required for implant -**
      - **if inadequate bone support may need ridge or site augmentation**
        - **ramus or chin graft (autograft)**
        - **DFDBA (allograft)**
        - **Bio-Oss(xenograft)**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **periodontium - bone support**
      - **place implants minimum of 2mm from IAN canal or below maxillary sinus**
    - **crown/root ratio**
    - **mobility**
    - **furcations**
    - **probing depths**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **periodontium**
    - **mucogingival problems**
      - **need sufficient tissue volume to recreate gingival papilla**
      - **need some attached gingiva to maintain peri-implant sulcus**
      - **1st year post-op bone resorption ~ 1mm**

        ***crest of bone optimal 2- 3mm below CEJ**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **periodontium**
    - **mucogingival problems**
      - **place implant 2-3mm apical to free gingival margin of adjacent tooth**
      - **recreates biologic width of peri-implant sulcus**
      - ***soft tissue height < 2mm or > 4mm may create challenge!**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **periodontium**
    - **oral hygiene - important pre & post**
    - **systemic manifestations - ie. diabetics are predisposed to delayed healing**
    - **destructive habits - *smoking* is contraindicated - delayed or inadequate tissue healing & osseointegration noted**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - teeth
    - periodontium
    - radiographic analysis
    - surgical analysis
    - esthetic analysis

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **radiographic analysis**
    - **periapical pathology**
    - **radiopaque/radiolucent regions**
    - **adequate vertical bone height**
    - **adequate space above IAN or below maxillary sinus**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **radiographic analysis**
    - **adequate interradicular area**
    - **bone quality & quantity**
    - **radiographs - panoramic and periapical (CT scan or tomography - as indicated)**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **radiographic analysis**
    - **radiographs - aid to determine amount of “space”& bone available**
      - **CT (computed tomography) scan - gives more accurate & reliable assessment of bone (quality, quantity & width) & locale of anatomic structures**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **radiographic analysis -**
    - **radiographic stent - (can double as surgical stent)**
    - **acrylic stent with lead beads or ball -bearings (5mm) placed in proposed fixture locations**
    - **allows more accurate radiographic interpretation**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **radiographic analysis -**
    - **distortion (common to all X-rays)**
      - **Panorex ~ 25% vertical; horizontal varies w/ head position (1.20-1.25x)**
      - **CT ~ 1:1; 1-2mm vertical error; *most accurate (1.0-1.1x)**
      - **Lateral Ceph ~ 8%**
      - **Periapical ~ 2.5-5%**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - teeth
    - periodontium
    - radiographic analysis
    - surgical analysis
    - esthetic analysis

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **surgical analysis -**
    - **surgical guide stent - *one of the most critical factors for obtaining an ideal surgical & esthetic result**
      - **used during fixture installation as guide for optimal B/L and M/D position**
      - **use of buccal channel drill guide allows improved access & visibility**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **surgical analysis -**
      - **implant length/diameter**
        - **determined by quantity of bone apical to extraction site**
        - **use longest implant safely possible**
        - **diameter dictated by corresponding root anatomy at crest of bone**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **surgical analysis**
    - **treatment options**
      - **immediate - place implant at time of tooth extraction**
      - **delayed immediate - 8-10 week delay**
      - **delayed - 9-10 months or longer**
  - **immediate will not allow bone resorption, but delayed allows bone fill for stabilization**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **surgical analysis**
    - **proper surgical technique during implant placement is critical**
    - **minimal heat generation important**
      - **< 47º Celsius for one minute or less provides most predictable healing response**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - teeth
    - periodontium
    - radiographic analysis
    - surgical analysis
    - esthetic analysis

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **esthetic analysis**
    - **smile line - high in maxilla; low in mandible**
    - **lip shape - full Vs. thin**
    - **existing ridge defect - if visible w/ high smile line will need augmentation**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **esthetic analysis**
    - **implant emergence profile (360º)**
      - **restored implant should appear to "grow" or emerge from the gingiva**
      - **very natural & desirable in appearance**
      - **avoid "tomato on a stick" crowns or periodontal problems may develop**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **occlusal analysis**
    - **advs/disadvs of proposed treatment**
    - **referrals/specialty consults**
    - **appointment sequencing**
    - **treatment alternatives**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **occlusal analysis**
    - **improvement of function and/or esthetics (?)**
    - **parafunctional habits**
      - **can be destructive**
      - **teeth lost to occlusal trauma or parafunction - less success w/ implants**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **occlusal analysis**
    - **diagnostic casts**
      (mounted to determine opposing occlusion)
    - **ridge width**
    - **existing inter-arch vertical space**
      14-15mm minimum for complete denture; partially edentulous varies by implant type

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **occlusal analysis**
    - **maxillo-mandibular relations**
      - **jaw classifications**
        - **Class II may have greatest benefit**
        - **Class III requires surgical intervention**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - occlusal analysis
    - advs/disadvs of proposed treatment
    - referrals/specialty consults
    - appointment sequencing
    - treatment alternatives

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **advs/disadvs of proposed treatment**
    - **are as individual as the case being treatment planned!**
      - **cost**
      - **patient desires**
      - **clinician abilities**
      - **etc.**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - occlusal analysis
    - advs/disadvs of proposed treatment
    - referrals/specialty consults
    - appointment sequencing
    - treatment alternatives

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **referrals/specialty consults**
    - **can prognosis be improved with (?):**
      - **orthodontics**
      - **periodontal therapy**
      - **endodontic therapy**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **referrals/specialty consults**
      - **pre-prosthetic surgery**

        extractions

        ridge contouring or exostosis removal

        osteotomy

        bone or soft tissue augmentation

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - occlusal analysis
    - advs/disadvs of proposed treatment
    - referrals/specialty consults
    - **appointment sequencing**
    - treatment alternatives

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **appointment sequencing**
      - **length of treatment time**
      - **need for multiple surgeries**

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - occlusal analysis
    - advs/disadvs of proposed treatment
    - referrals/specialty consults
    - appointment sequencing
    - treatment alternatives

Implant Guidelines

- **Treatment planning phase**
  - **Problem list & treatment considerations**
    - **treatment alternatives**
      - **fixed partial dentures**
      - **removable partial dentures**
      - **resin-bonded fixed partial dentures**
      - **orthodontics**
      - **do nothing!**

Implant Guidelines

- Treatment planning phase
  - Indications
    - good general health
    - adequate bone quality & volume
    - appropriate occlusion & jaw relations
    - inability to wear conventional prosthesis
    - unfavorable number/location of abutment
    - single tooth loss

Implant Guidelines

- **Treatment planning phase**
  - **Contraindications**
    - unrealistic patient expectations
    - alcohol/drug dependence (smoking)
    - parafunctional habits
    - psychological factors
    - anatomical factors
    - inadequate ridge/interarch dimensions
    - immunosuppression

Implant Guidelines

- **Treatment planning phase**
  - **Contraindications (relative)**
    - (need surgical intervention)
    - **ramus graft**
      - inadequate bone at implant site
      - excessive bony concavities
    - **sinus lift or IAN transposition**
      - inadequate vertical space for implant

Implant Guidelines

- **Treatment planning phase**
  - **“Osseointegrated implants can be placed in the irradiated mandibles of selected patients without hyperbaric oxygen treatment”**

    Niini, Ueda, Keller, Worthington; *Experience with Osseointegrated Implants Placed in Irradiated Tissues in Japan and the United States*, Intl J Oral Maxillofac Implants 1998; 13:407-411

Implant Guidelines

- **Maintenance**
  - Criteria for success
  - Maintenance and Recall
  - Hygiene Aids
  - Problems

Implant Guidelines

- **Maintenance**
  - **Primary goal is to protect and maintain “tissue-integration”;**

    good oral hygiene **is a key element!**

Implant Guidelines

- **Maintenance**
  - **“Implant patients should be thoroughly instructed in maintenance therapy with the understanding that the patient serves as co-therapist”**

Grant et al, *Periodontics, in the Tradition of Gottlieb and Orban*, ed 6. St. Louis, CV Mosby Co, 1988, pp1075-1094.

Implant Guidelines

- **Maintenance**
  - **“Any practitioner wishing to practice dental implantology must be knowledgeable concerning postinsertion maintenance of the implant”**

1988 National Institutes of Health Consensus Development Conference

Implant Guidelines

- **Maintenance**
  - **Criteria for success**
  - **Maintenance and Recall**
  - **Hygiene Aids**
  - **Problems**

Implant Guidelines

- **Maintenance**
  - **Criteria for success:**

    (most important is good diagnosis!)
    - no peri-implantitis
    - no associated radiographic radiolucency
    - marginal bone loss 1.0-1.5mm first year; then < 0.1mm annually thereafter

Implant Guidelines

- **Maintenance**
  - **Criteria for success:**
    - tissue integration: bone/soft tissue “osseointegration”
    - absence of mobility
    - no progressive soft tissue changes or bone loss
    - stable clinical attachment level

Implant Guidelines

- **Maintenance**
  - **Criteria for success:**
    - absence of bleeding upon probing/excessive probing depths
    - absence of discomfort
    - success rate varies with bone quality, loading dynamics, etc.

Implant Guidelines

- **Maintenance**
  - **Criteria for success:**
    - anticipated success rate of +97% anterior mandible; 90% maxilla; decreases in posterior quadrants due to poorer bone quality (10 yrs)
      - best bone: good cortical with some cancellous for vascular supply

Implant Guidelines

- **Maintenance**
  - Criteria for success
  - **Maintenance and Recall**
  - Hygiene Aids
  - Problems

Implant Guidelines

- **Maintenance**
  - **Maintenance & Recall:**
    - ***Four elements***
      - home-care regimen
      - periodic recalls reinforcing regimen
      - strict adherence to recall schedule & verification of function, comfort, and esthetics
      - lifetime maintenance commitment

Implant Guidelines

- **Maintenance**
  - **Maintenance & Recall:**
    - ***Frequency of recall***
      - immediate post-delivery
      - 24 hours
      - one week
      - two weeks (re-torque if needed)
      - 6 months
      - bi-annual or annual evaluation

Implant Guidelines

- **Maintenance**
  - **Maintenance & Recall:**
    - ***Clinical Parameters of Evaluation***
      - oral hygiene including plaque index
      - implant stability (evaluate mobility)
      - retrievability
      - peri-implant tissue health
      - crevicular probing depths

Implant Guidelines

- **Maintenance**
  - **Maintenance & Recall:**
    - ***Clinical Parameters of Evaluation***
      - bleeding
      - radiographic assessment (serial)
        - crestal bone level & integrity of attachment systems
      - proper torque on screw joints
      - occlusion

Implant Guidelines

- ***Clinical Parameters of Evaluation***
  - **oral hygiene (plaque index)**
    - **plaque is 1º etiologic factor in tissue destruction (peri-implant and natural tooth)**
    - **review oral hygiene instruction**
    - **monitor through plaque indices**
    - **same requirements as for natural teeth**
    - **use neutral sodium fluorides**

Implant Guidelines

- ***Clinical Parameters of Evaluation***
  - **implant stability (evaluate mobility)**
    - **may be the *key indicator* of fixture health**
    - **minimal mobility w/ osseointegrated fixtures: 17- 57um buccal;17- 66um lingual)**
    - **no significant difference in osseointegrated fixture mobility relative to fixture length (Sekine et al)**
    - **implants may sustain extensive bone loss w/o inc mobility if critical amount bone left**

Implant Guidelines

- ***Clinical Parameters of Evaluation***
  - **retrievability**
    - **failing implant may be masked if connected to same prosthesis**
    - **important to remove FPD to evaluate**
    - **annual removal recommended for multiple-unit prosthesis**
    - **early failure detection will minimize fibrous tissue zone size & may allow placement of wider diameter fixture**

Implant Guidelines

- ***Clinical Parameters of Evaluation***
  - **peri-implant tissue health**
    - **visual inspection: signs of pathoses?**
      - **Alterations in color, contour & consistency**
    - **alveolar mucosa may surround implant & appear more erythematous than gingiva**
    - **tissue movement when adjacent tissues retracted may affect soft-tissue-implant attachment ~ (detrimental)**
    - **perimucosal keratinized tissue is best**

Implant Guidelines

- ***Clinical Parameters of Evaluation***
  - **crevicular probing depths**
    - ***most accurate means of detecting peri-implant destruction*** **(use plastic probes)**
    - **probing measurements closely approximate actual bone levels**
    - **avoid during first 3 months after abutment connection to avoid damaging weak epithelial attachment**
    - **may be difficult if threads supra-osseous**

Implant Guidelines

- ***Clinical Parameters of Evaluation***
  - **bleeding**
    - **controversy as to significance of BOP at peri-implant interface**
    - **BOP may precede clinical signs of inflammation**
    - **BOP & radiographic changes are most valid indicators of peri-implant breakdown**
    - **recommend continued use of peri-implant sulcus probing to monitor implant success**

Implant Guidelines

- ***Clinical Parameters of Evaluation***
  - **radiographic assessment**
    - **one of most valuable measures of implant success**
    - **of value when**
      - **cannot probe area due to constricted implant neck, and**
      - **to assess future mobility without FPD removal**
      - **to accurately determine amount of bone loss in absence of increased crevicular depth**

Implant Guidelines

- ***Clinical Parameters of Evaluation***
  - **radiographic assessment**
    - **compare bony changes with stable landmarks - implant threads -**
      - **(one-half thread = 0.3mm)**
    - **compare horizontal/vertical implant dimensions between serial radiographs**
    - **periapical radiographs = 2.5 - 5% image magnification Vs. direct clinical measurements**

Implant Guidelines

- ***Clinical Parameters of Evaluation***
  - **radiographic assessment**
    - ***bone level determination should be based only upon standardized periapical radiographs***
    - **threads of implant must appear sharp & well-delineated on X-ray to be accurate**
    - **X-ray beam: direct ± 9º from line perpendicular to long axis of implant**
    - **keep film parallel & close to implant**

Implant Guidelines

- ***Clinical Parameters of Evaluation***
  - **radiographic assessment**
    - **recommend kVp of not < 60 (best 65-70)**
    - **exposure time determined so internal mechanical structure of fixture is clearly visible**
    - **use long-cone paralleling technique w/ paralleling film holder**
    - **can use intra-oral landmarks and film holder to standardize horizontal angulation**

Implant Guidelines

- ***Clinical Parameters of Evaluation***
  - **radiographic assessment**
    - **quality in film development is paramount!!!**
    - **post-op radiographic intervals:**
      - **not between fixture placement to abutment connection**
      - **one week after abutment insertion**
      - **immediately following fixed prosthesis insertion, then 6 months later**
      - **annually for first 3 years, then every 2 years**

Implant Guidelines

- ***Clinical Parameters of Evaluation***
  - **radiographic assessment**
    - **expect 1.0mm marginal bone loss during first year postinsertion; ≤ 0.1mm per year anticipated thereafter**
    - **greater bone loss observed in maxilla**

Implant Guidelines

- ***Clinical Parameters of Evaluation***
  - **radiographic assessment**
    - **rapid bone loss seen if:**
      - **fractured fixture**
      - **initial osseous trauma at insertion**
      - **fixture over-tightening**
      - **occlusal trauma**
      - **poor adaptation of prosthesis to abutment**
      - **“normal” physiologic response**
      - **plaque-associated infection (peri-implantitis)**

Implant Guidelines

- ***Clinical Parameters of Evaluation***
  - **radiographic assessment**
    - **REMEMBER .....**

      Endosseous implants may lose extensive amounts of bone support without showing rather obvious radiographic changes or increase in mobility detectable in periodontally involved teeth !!!

Implant Guidelines

- ***Clinical Parameters of Evaluation***
  - **proper torque on screw joints**
    - loosened screws are the most common problem
    - can result in localized inflammation, loose restorations, and discomfort
    - if re-torquing a loose abutment - care not to strip or “round-off” the hex
    - excessive force can fracture screw/implant or create increased stresses in the bone

Implant Guidelines

- ***Clinical Parameters of Evaluation***
  - **occlusion**
    - **excessive force concentrations - result in extensive bone loss and implant fracture**
      - **MAJOR CAUSE: poor abutment prosthesis adaptation**
      - **poor force distribution & improperly planned occlusal schemes also factors**
    - **recommend anterior guidance ** BEST**
    - **group function/balanced occlusion also**

Implant Guidelines

- ***Clinical Parameters of Evaluation***
  - **occlusion**
    - goal to prevent lateral forces on posterior implants concentrated in cervical area
    - relationship between parafunctional activity & increased marginal bone loss
    - ideal is “light centric” occlusion only; no contact in lateral excursions
    - no contact in MI, but with hard clench will hold shim stock (.0001”)

Implant Guidelines

- **Maintenance**
  - Criteria for success
  - Maintenance and Recall
  - **Hygiene Aids**
  - Problems

Implant Guidelines

- **Maintenance**
  - **Hygiene Aids:**
    - **plastic scalers - ONLY! - for abutment scaling to prevent easy abrasion of soft titanium; use in only one direction starting at the gingiva (best are from 3i)**
    - **ultrasonic scalers - NO! - do not use Titan-S or ultrasonic scalers unless special non-metal tips used**

Implant Guidelines

- **Maintenance**
  - **Hygiene Aids:**
    - **prophy jets - use with caution!**
    - **fine prophy paste or flour of pumice - OK! - use with blue rubber tips or rubber prophy cups**
    - **Super-Floss or Post-care - nylon fibers - thread for interproximal use between abutments and under extensions**

Implant Guidelines

- **Maintenance**
  - **Hygiene Aids:**
    - **end-tufted & small interdental brushes** (Proxibrushes) - for cleaning buccal & lingual abutment surfaces; all metal surfaces must be nylon coated
    - **electric toothbrushes** - use at discretion of dentist; may be useful if limited manual dexterity

Implant Guidelines

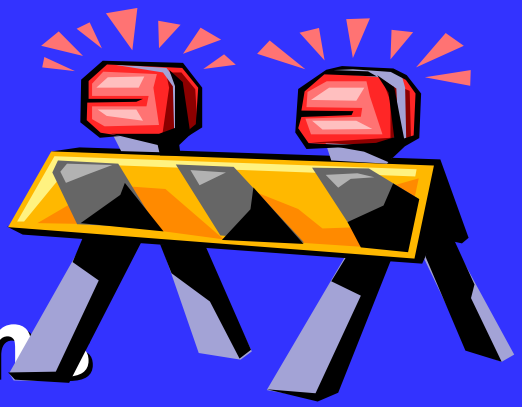
- **Maintenance**
  - **Hygiene Aids:**
    - **chlorhexidine** - use during peri-surgical periods or as needed if episodes of acute soft tissue inflammation occur
    - **fluoride rinses or gels** - use neutral sodium fluoride to avoid damage to titanium fixtures that may occur with acidulated types

Implant Guidelines

- **Maintenance**
  - Criteria for success
  - Maintenance and Recall
  - Hygiene Aids
  - **Problems**

Implant Guidelines

- **Maintenance**
  - **Problems:**
    - soft tissue reaction
    - fractured or loosened screws
    - failing or failed fixture
    - broken attachments/ components



Implant Guidelines

- **Problems:**
  - **soft tissue reactions**
    - **most common due to loose screws**
    - **poor oral hygiene can lead to "peri-implantitis" - may result in progressive bone loss**
    - **lack of attached periabutment soft tissue**
    - **failed or failing implants**

Implant Guidelines

- **Problems:**
  - **soft tissue reactions**
    - **treatment:**
      - **remove offending screw, tighten abutment & reinsert prosthesis**
      - **reinforce oral hygiene**
      - **soft-tissue autograft**
      - **replacement of failed implant**

Implant Guidelines

- **Problems:**
  - **fractured or loosened screws**
    - **1st suspicion when complaint of "loose" implant or discomfort**
    - **use correct screwdriver for screw head without excess force or can "round off" hex**
    - **if retrieving ("teasing out") fractured screw caution not to damage hex**

Implant Guidelines

- **Problems:**
  - **failing or failed fixture**
    - **failing implant Vs failed implant**
  - **“implantitis” Vs periodontal disease**

Implant Guidelines

- **Problems:**
  - **failing or failed fixture**
    - failing implant
      - **clinical signs**: progressive crestal bone loss; soft tissue pocketing; BOP w/ possible purulence; tenderness to percussion or torque

Implant Guidelines

- **Problems:**
  - **failing or failed fixture fixture loss**
    - **failing implant**
      - **causes: surgical compromises (bone overheating, lack of initial stability); nonpassive superstructures; too rapid initial loading; functional overload; inadequate screw joint closure; infection**

Implant Guidelines

- **Problems:**
  - **failing or failed fixture fixture loss**
    - failing implant
      - **treatment:**
      - remove and replace with larger diameter fixture; or treat infection & re- evaluate
      - interim - remove prosthesis & abutments & irrigate area w/ CHX; disinfect components & reinsert

Implant Guidelines

- **Problems:**
  - **failing or failed fixture fixture loss**
    - **failed implant**
      - **clinical signs: mobility; “dull” percussion sound; peri-implant radiolucency**
      - **(connective tissue implant encapsulation may not be visible on radiograph)**

Implant Guidelines

- **Problems:**
  - **failing or failed fixture fixture loss**
    - **failed implant (most noted at Stage II)**
      - **causes: surgical compromises (bone overheating, lack of initial stability); nonpassive superstructures; too rapid initial loading; functional overload; inadequate screw joint closure; infection**

Implant Guidelines

- **Problems:**
  - **failing or failed fixture fixture loss**
    - **failed implant (most noted at Stage II)**
    - **treatment:**
      - **removal of implant**

Implant Guidelines

- **Problems:**
  - **failing or failed fixture fixture loss**
    - **“implantitis” Vs periodontitis**
      - **clinical signs:similar clinical presentation w/ same pathogenic microorganisms**
      - **causes:poor oral hygiene; bacteria; cause may be unknown (?)**

Implant Guidelines

- **Problems:**
  - **failing or failed fixture fixture loss**
    - **“implantitis” Vs periodontitis**
      - **treatment:**
      - **consults to provider - consider remake or guided tissue regeneration, etc.**
      - **interim - remove prosthesis & abutments & irrigate area w/ CHX; disinfect components & reinsert**

Implant Guidelines

- **Problems:**
  - **broken attachments/ components**
    - **remove offending attachment (if possible) and replace or provisionalize**
    - **be careful not to damage external hex or scratch titanium fixture or abutment**

Implant Guidelines

- **Case Selection**
  - Implant recommended
    - replacement of teeth #27,19 & 30
  - Implant not recommended
    - replacement of tooth #28s

Case #1

Implant Guidelines

- **Implant recommended**
  - 46 y/o male presented with failing NSRCT #27 and severe localized periodontitis
  - tooth deemed hopeless and extracted

Implant Guidelines

- **Implant recommended**
  - **4.0 x 18mm Nobelpharma fixture placed**

Implant Guidelines

- **Implant recommended**
  - **Cera-One abutment restored with cemented (Ketac Cem) PFM crown**

Case # 2

Implant Guidelines

- **Implant recommended**
  - 31 y/o female presented with missing #19 & 30, and retained #17 & 32 (third molars)

Implant Guidelines

- **Implant recommended**
  - **mesial-angulated #18 & 31 with inadequate mesial-distal and interarch spacing due to super-erupted opposing # 3 & 14**

Implant Guidelines

- **Implant recommended**
  - **buccal-lingual ridge widths in areas of missing #19 and #30 also deficient**

Implant Guidelines

- **Implant recommended**
  - **teeth # 17 & 32 extracted and bilateral ramus grafts placed at edentulous sites (#19 & 30)**

Implant Guidelines

- **Implant recommended**
  - molar uprighting of teeth #18 & 31 completed to create adequate space for implants

Implant Guidelines

- **Implant recommended**
  - **5.0 x 11.5mm 3i fixtures placed bilaterally**

Implant Guidelines

- **Implant recommended**
  - restoration of fixtures with screw-retained non-segmented UCLA abutments w/ PFM crowns

Implant Guidelines

- **Implant recommended**
  - restoration of teeth # 3 & 14 with PFM crowns to re-establish proper occlusal plane

Case # 3

Implant Guidelines

- **Implant not recommended**
  - 34 y/o male presented with past history of supernumerary #28
  - Note: dilacerated root to mesial on #28

Implant Guidelines

- **Implant not recommended**
  - edentulous site presented with inadequate facial bone, and inadequate spacing existed between #27 & 28 root apices to allow implant placement

Implant Guidelines

- **Implant not recommended**
  - **after two years of orthodontic therapy, #28 failed to move to facilitate implant placement**

Implant Guidelines

- **Implant not recommended**
  - **edentulous area restored with a resin-bonded fixed partial denture (RBFPD #27-28)**